TRICHOCOCCUS SPECIES AS CATALYSTS FOR BIOTECHNOLOGICAL PRODUCTION OF 1,3-PROPANEDIOL

NIKOLAOS STREPIS[1,2] (NIKOLAOS.STREPIS@WUR.NL),
JASPER KOEHORST[2],
HENRY BENAVIDES NARANJO[1] (HENRY.NARANJO@WUR.NL),
PETER SCHAAP[2] (PETER.SCHAAP@WUR.NL),
ALFONS J.M. STAMS[1,3] (FONS.STAMS@WUR.NL),
DIANA Z. SOUSA[1] (DIANA.SOUSA@WUR.NL)

[1] Laboratory of Microbiology, Wageningen University, Stippeneng 4, 6708 WE Wageningen, The Netherlands
[2] Laboratory of Systems and Synthetic Biology, Wageningen University, Stippeneng 4, 6708 WE Wageningen, The Netherlands
[3] Centre of Biological Engineering, University of Minho, 4710-057 Braga, Portugal

Nowadays, large amounts of waste glycerol are generated as a major byproduct from biodiesel industry. Glycerol can be converted to 1,3-propanediol (1,3-PDO), a building block for the synthesis of polyester and biodegradable plastic fibers. We have previously isolated a novel *Trichococcus* species, strain ES5, which is capable to anaerobically produce 1,3-PDO from glycerol, an ability it shares with *Trichococcus pasteurii*. In this work, we analyzed and compared the genomes of these two bacteria and studied the production of 1,3-PDO by cultures of *T. pasteurii* and strain ES5 under different conditions. A continuous bioreactor system was established for achieving production of 1,3-PDO. A complete operon structure composed by 16 genes related to 1,3-PDO metabolism could be identified in the genomes of *T. pasteurii* and strain ES5. This genomic synteny contains the two essential genes for glycerol conversion to 1,3-PDO, glycerol dehydratase and 1,3-propanediol dehydrogenase, and additional genes for glycerol uptake and regulation factors of glycerol metabolism. The metabolic trait of 1,3-production was *in silico* analysed for the complete bacterial kingdom and genes were identified with an essential or accessory influence for the trait.

Bacteria with fewer genes were underperforming when tested in vitro for production 1,3-PDO. Furthermore, both *Trichococcus* strains could grow on glycerol in a broad range of temperatures, from 4 to 40oC and strain ES5 achieved growth in 0oC. Such physiological properties may be advantageous for biotechnological production. Tolerance to high salinity may be an additional strength of *Trichococcus* species as a candidate for the biotechnological production of 1,3-PDO.

Keywords
glycerol; fermentation; 1,3-propanediol; low temperature; high-salinity; genome comparison